

CM 2542



(11) **EP 0 947 185 A2**

(12) **EUROPEAN PATENT APPLICATION**

(43) Date of publication:
06.10.1999 Bulletin 1999/40

(51) Int. Cl.⁶: **A61F 13/15**

(21) Application number: **99114110.2**

(22) Date of filing: **30.01.1996**

(84) Designated Contracting States:
CH DE ES FR GB IT LI NL

(30) Priority: **23.02.1995 WO PCT/EP95/00665**

(62) Document number(s) of the earlier application(s) in
accordance with Art. 76 EPC:
98114701.0 / 0 901 781
96903949.4 / 0 814 736

(71) Applicant:
H.B. Fuller Licensing & Financing, Inc.
St. Paul, Minnesota 55110-5132 (US)

(72) Inventors:

- **Werenicz, Harald**
21391 Reppenstedt (DE)
- **Wittkopf, Thomas**
21360 Vögelzen (DE)
- **Voss, Gerhard**
21335 Lüneburg (DE)

- **Remmers, Peter**
21039 Hamburg (DE)
- **Katsaros, Mark G.**
Doloth, GA 30097 (US)
- **Polance, Robert Gordon**
Lino Lakes, MN 55014 (US)
- **Kroll, Mark S.**
Arden Hills, MN 55112 (US)

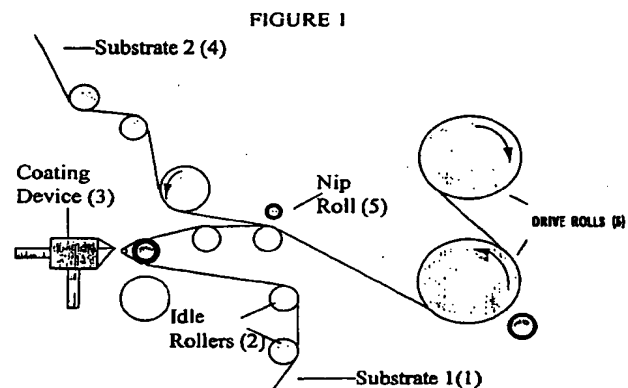
(74) Representative:
Maiwald, Walter, Dr. Dipl.-Chem. et al
Maiwald GmbH,
Elisenhof,
Elisenstrasse 3
80335 München (DE)

Remarks:

This application was filed on 16 - 07 - 1999 as a
divisional application to the application mentioned
under INID code 62.

(54) **Method for producing a continuous thermoplastic coating and articles constructed therefrom**

(57) This invention relates to a non-contact coating method for producing a continuous coating and articles constructed therefrom. This invention further relates to a method for producing a textile material with a moisture-impermeable barrier layer and to a method for producing a moisture-absorbing article of hygiene which has such a barrier layer. This invention particularly relates to a textile material and hygienic disposable articles comprising a body fluid impermeable barrier layer produced from said coating method. Preferably, the thermoplastic composition used in the method for producing the barrier layer exhibits certain rheological characteristics.



Description

Field of the Invention

5 [0001] This invention relates to articles obtainable by using a non-contact coating method for producing a continuous coating, on a substantially non-porous substrate. This invention particularly relates to articles obtainable by coating thermoplastic or hotmelt adhesive materials on a heat sensitive material or plastic material. The compositions used in the coating method exhibit certain rheological characteristics.

10 [0002] Conventional slot nozzle coatings are typically done by keeping the slot nozzle in permanent contact with the substrate such that the nozzle lies on the substrate during the coating. It is unproblematic to coat hotmelt adhesives onto substrates with slot nozzles or spray coating methods, provided that only a discontinuous coating is required, such as for constructive applications wherein the coating weight of the hotmelt ranges from about 3 g/m² to about 10 g/m². If, however, a continuous layer is to be created, this can only be done using these customary coating methods if the coating weight of the hotmelt is greater than about 30 g/m².

15 [0003] Such high coating weights are expensive. Furthermore, direct coating with a slot nozzle provides substantial mechanical and thermal stresses on the coated substrates, especially since the slot nozzle is heated during coating. Therefore, very sensitive substrates, especially heat sensitive substrates, can not always be coated with hotmelt from a slot nozzle in a customary manner without damaging the substrate. Such problems cannot be overcome when coating with heated coating rollers or spray coating with heated airstreams. The high coating weights of this prior art lead to increased stiffness of the coated substrate. Similar problems occur in the production of hygienic articles and in other areas, such as fabric production, wherein the resulting materials are required to exhibit liquid impermeability. Presently, in such technical fields, production methods utilizing performed laminated films are preferred.

20 [0004] Therefore, there remains a need for a non-contact method capable of producing a continuous coating layer having low coating weights.

Summary of the Invention

25 [0005] The applicants have found a coating method that overcomes the aforementioned problems. The coating method employs a noncontact application wherein a thermoplastic composition is thermally made flowable and released from a coating device onto a substrate. The thermoplastic composition is thus coated onto the substrate without contact between said coating device and said substrate. Specifically, the invention resides in an article obtainable by coating a thermoplastic composition or a hotmelt adhesive composition onto a substantially non-porous substrate, comprising the steps of:

- 35 a) making a thermoplastic composition or a hotmelt adhesive flowable;
 b) advancing a substrate along a path;
 c) dispensing a continuous film of said thermoplastic composition or said hotmelt adhesive composition from a coating device at a coating temperature wherein the complex viscosity of the thermoplastic composition is less than about 500 poise at about 1000 radians/second and ranges from about 100 poise to about 1000 poise at about 1
 40 radian/second;
 d) suspending said film between said coating device and said substrate;
 e) contacting said film with said advancing substrate.

45 [0006] In another aspect, the invention resides in an article obtainable by coating a thermoplastic composition or a hotmelt adhesive composition which has been thermally made flowable, from a coating device onto a substantially non-porous substrate, characterized in that said composition is released from said coating device at a temperature of less than 125°C, preferably less than 120°C and even more preferably less than 110°C as a continuous coating without contact between said coating device and said substrate, and is subsequently disposed upon the surface of said substrate.

50 [0007] In yet another aspect, the invention resides in an article comprising a substrate and at least one hot-melt adhesive layer adhered to at least one face of the substrate, wherein the hot-melt adhesive is coated as a continuous film having an area weight of less than 20 g/m².

55 [0008] Since the method employs low coating weights of the thermoplastic composition, it eliminates the economic disadvantages of current methods as well as improves the tactile quality of the resulting article. Preferably, the substrate is a heat sensitive material which in the context of this invention means for example material made of low gauge polyethylene or a plastic material such as e.g. polyolefins, especially polyethylene, polypropylene and amorphous polyolefins. Since the coating device and substrate do not contact each other, the mechanical and thermal stresses on the substrate are much less than in prior art methods.

[0009] On heat sensitive substrates, the thermoplastic composition is preferably coated at temperatures of less than

125°C, preferably less than 120°C and even more preferably less than 110°C, to reduce the heat-induced stresses on the substrates being coated. This is advantageous for coating and mutually bonding thermally sensitive substrates. The thermoplastic composition exhibits certain rheological characteristics such that the complex viscosity at high shear rates (1,000 rad/sec) is less than about 500 poise and the complex viscosity at low shear rates (1 rad/sec) is between about 100 and about 1,000 poise. Some neat thermoplastic resins, such as typical film grade polyolefins, may be suitable for the method of the present invention. However, compounded hotmelt adhesives are preferred due to the ability to independently control the visco-elastic properties, open time, etc. Compounded hotmelts are also advantageous to insure adequate adhesion to the carrier substrate or for delayed detackification of the coating after adherence to the substrate.

[0010] The resulting coating produced from said method is useful for a variety of applications wherein a consistent continuous coating is desired. Coating weights of less than 30 g/m² of the thermoplastic composition are preferred to reduce expenditure and to prevent an increased stiffness of the coated substrate. However, coating weights higher than 30 g/m² may be useful for other applications wherein reducing the mechanical and heat-induced stresses is of primary importance.

[0011] The coating method is particularly advantageous for manufacturing as it employs fewer production steps than prior art coating methods. Improving productivity as well as reducing the coating weight mass per area results in coatings and corresponding articles that are less expensive than prior art.

Brief Description of the Drawing

[0012]

Figure 1 depicts the method of the present invention wherein a continuous thermoplastic coating is formed and adhered to a carrier substrate.

Detailed Description of the Drawing

[0013] A substantially non-porous substrate 1 (1) travels past a series of idle rollers (2) to ensure the web is in proper alignment prior to approaching the coating device (3). At start up the coating device is initially in contact with the substrate to adhere the leading edge of the coating to the substrate. As Substrate 1 is advanced by the drive rolls (6), the coating device is removed from Substrate 1 at a distance most often ranging from about 0.5 mm to about 20 mm, depending on the properties of the thermoplastic composition being coating. Substrate 2 (4) is optionally adhered to the coating surface by means of a nip roll (5). Substrate 2 may be any substrate such as films, coverstock materials, as well as any material that is not necessarily in the form of a web.

Detailed Description of the Invention

[0014] In the method of the present invention, a melted hotmelt adhesive, preferably substantially air-free, is released from a coating or release device in such a way that it exits the device as a continuous film. A typical example for this is a slot nozzle, as it has previously been used for coating in direct contact with a substrate. Thus, melt coating devices which are already at hand can be reset for use according to the invention in that the slot nozzle is lifted off the substrate and is adjusted to have a suitable distance from the substrate. When the viscous but flowable molten adhesive leaves the coating device, it does not contact the substrate immediately, but rather travels for a distance as a continuous coating film suspended above the substrate without touching either the device or the substrate. The distance between the coating device and the substrate ranges from about 0.5 mm to about 20 mm. It is possible that at suitable machine speed settings, and with specific adhesives or other coating materials, the distance can be even greater than 20 mm. The distance is largely dictated by the viscosity and open time of the thermoplastic composition being coated. The thermoplastic composition cools sufficiently in its suspended state such that it has built in viscosity and cohesive strength to the extent that any unevennesses present on the substrate surface cannot penetrate the coating, yet the thermoplastic composition is molten or soft enough to adequately adhere to the substrate.

[0015] It has been shown to be especially advantageous, that the coating later contacts the substrate in a substantially horizontal direction rather than in a vertical direction. To realize this advantage, a roller can be provided in the path of movement of the substrate to give the substrate a substantially vertical, upward direction, as the substrate passes the coating device. Additionally, the coating device, such as a slot nozzle, can be provided substantially horizontally beside the roller so that the coating travels from the side towards the surface of the substrate.

[0016] The diameter of the coating role is preferably about 15 mm to about 50 mm in diameter with the nozzle slightly above the center of the coating roll such that the angle at which the thermoplastic coating contacts the substrate is less than about 60° as the substrate is moving away from the nozzle. The coating head is adjusted by one of ordinary skill

in the art to optimize for even flow and distribution of the thermoplastic coating over the entire width of the application.

[0017] Thereafter, the sufficiently cooled coating contacts the substrate surface and adheres to the surface. If the thermoplastic coating is of such a composition that it substantially detackifies after sufficient cooling, the laminate of the coated substrate, thus formed, can be rolled up and stored. The laminate can then be used at some later time, e.g. as a body fluid impermeable backsheet having improved tactile quality in a disposable hygienic article. The laminate can be bonded by any suitable bonding technique including ultrasonic bonding, heat welding, or more commonly adhesive bonding.

[0018] Preferably, the coating of the barrier layer is done "inline" immediately before any further processing of the thus produced coated material. In such a case, the surface of the barrier layer which is pointing away from the substrate and is still sufficiently tacky can be used for a constructive adhesion step and therefore can also serve to bond the coated material to other substrates. Other substrates that could be simultaneously bonded in this manner include films, as well as various other materials.

[0019] Since the hotmelt coating can be provided at extremely low temperatures, especially materials can be provided with barrier layers which are too sensitive mechanically and / or thermally for customary coating methods.

[0020] Such sensitive materials include low gauge polyethylene materials and the like.

[0021] A substantial advantage of the invention is that continuous, sufficiently impermeable barrier layers can be made from hotmelts at very low coating weights. Even with customary commercially available hotmelts, closed barrier layers can be produced at coating weight of not more than 30 g/m², and generally, it is easily possible to achieve coating weights between 10 g/m² and 20 g/m² and most preferably less than 10 g/m². Prior art coating of hotmelts according to customary methods for forming edge leakage barriers, as in US patent 4,692,161, requires area weights of about 70 g/m² to create the preferred film thickness of around 75 µm. At thickness of 25 µm, the suggested minimum according to this art, the contact-coated layer is perforated by substrate fiber, and is not closed.

[0022] The very thin barrier layers which can be produced according to the invention do not only contribute to the economical advantages of the inventive method, but also make it possible to achieve a very much reduced stiffness of the material, which thus comes much closer, in its properties, to a material which is not provided with a coating layer at all.

The Thermoplastic Composition

[0023] As previously mentioned, uncompounded thermoplastic material such as polyolefins, especially polyethylene, polypropylene, amorphous polyolefins such as Vestoplast 703® (Hüls) and the like, may be suitable thermoplastic materials for the coating method of the present invention. However, hotmelt adhesives are preferred due to the ability to independently tailor the viscoelastic properties, open time, tack, and various other properties. Hotmelt adhesives commonly have melt flow indices required for such processing already at very low temperatures. Typical hotmelts are fluid enough for such processing at temperatures ranging from about 60°C to 110°C.

[0024] The thermoplastic composition exhibits certain rheological characteristics such that a continuous coating can be produced at coating weights of less than about 30 g/m². In general, the rheological properties fall within a rheological window wherein the complex viscosity at high shear rates (1,000 rad/sec) is less than about 500 poise and the complex viscosity at low shear rates (< 1 rad/sec) is between about 100 and about 1,000 poise. In other words, preferable thermoplastic compositions exhibit Newtonian regions at low shear rates and shear thinning at higher shear rates. Thermoplastic compositions having wide windows of application are those in which the composition exhibits the appropriate rheological properties at a variety of application settings, particularly low temperatures. Narrow application windows are those in which the rheological parameters are only met under very specific conditions. Amorphous polyolefins based hotmelt adhesives such as Lunatack® D-8370 (H. B. Fuller Company) tend to exhibit relatively flat viscosity curves at low shear rates (less than about 10 rad/sec) and consequently relatively wide application windows. Block copolymer based hotmelt adhesives tend to exhibit particularly steep viscosity profiles causing very narrow application windows.

[0025] Data generated that supports this rheological window is depicted in Table 1. The test procedures used to determine the rheological data are described in detail hereinafter.

[0026] The applicants surmise that the high shear information relates to the processing conditions at the slot die exit. A composition with too high of a complex viscosity at 1,000 radians/sec would require excessive pump pressure to exit the coating device. A die with a shim gap larger than 3 mm could be used to process these materials but a higher coating weight may result.

[0027] The low shear information relates to the settling of the coating on the substrate during the time it is suspended above the substrate. If the low shear value is too high, the coating may not adhere adequately to the substrate and / or the thermoplastic composition builds up at the nozzle causing a streaked, discontinuous coating. If the low shear viscosity is too low, the coating may seep into the substrate, causing poor barrier properties.

[0028] Extensional viscosity, which was not measured can also strongly influence the melt strength. Higher levels of branching or the addition of a small concentration of a high molecular weight material can strongly influence the melt strength. More preferred, are compositions that meet the target rheological parameters at low application temperatures

of less than 125°C, preferably less than 120°C, and best less than 110°C.

[0029] Accordingly, many known hotmelt adhesive compositions are well suited for use in the coating method of this invention. Hotmelt adhesives typically comprise at least one thermoplastic polymer, at least one plasticizer and at least one tackifying resin. Preferably, such suitable hotmelts comprise up to 40 % by weight of thermoplastic polymer, up to 40 % by weight of a plasticizer and up to 70 % by weight of tackifying resin.

[0030] With respect to the thermoplastic polymer, atactic polyalphaolefins such as Vestoplast® 708 (Hüls) and synthetic rubbers such as S-EB-S block copolymers have been found to be especially suited, particularly those as used in hotmelt adhesives such as Lunatack® D-3964 (H. B. Fuller). Further, however, also other thermoplastic polymers are suitable, such as ethylene-vinylacetate copolymers or other synthetic rubbers as available in commerce under the tradenames Kraton®, Solprene®, and Stereon®.

[0031] Plasticizers and tackifying resins used in hotmelt adhesives are known. Oils such as naphthenic oils are preferred plasticizers. As for tackifying resins, those resins already known for such purposes are generally suitable, especially hydrocarbon resins, ester resins and other such compatible resins. The components are mixed and processed in a known manner to prepare the hotmelts which can be used according to this invention.

[0032] With suitable hotmelts, such as those described in DE-A-41 21 716, it is also possible to make materials which are impermeable to liquid water, yet water vapor permeable rendering the coating "breathable".

[0033] In addition to commonly known hotmelt adhesives, thermoplastic compositions comprising a water soluble, saline (body fluid) insoluble copolyester such as Eastman AQ 1350®, commercially available from Eastman, are also particularly useful for creating barrier films that are impervious to body fluid, yet readily water soluble. This feature is of particular interest for creating flushable and compostable disposable hygienic products. Furthermore, there may be applications wherein water permeability is desired. Accordingly, this coating method may also be suitable for coating water permeable, water soluble and / or biodegradable thermoplastic materials.

[0034] Hereinafter, the invention will be further depicted by the following non-limiting examples. These relate to coatings on more or less porous materials (nonwovens), but should be read to exemplify coatings on the non-porous materials of this invention, since the method and the coating materials are the same, irrespective of the porosity of the substrate.

Embodiment example 1:

[0035] Several hotmelts which slightly differ from each other in composition were formulated in the following composition ranges:

- 20 - 25 % naphthenic oil
- 30 - 40 % atactic polyolefin(s)
- 35 - 45 % hydrocarbon resin

Embodiment example 2:

[0036] Several hotmelts were formulated within the following range limits:

- 15 - 20 % SIS-block copolymer
- 15 - 25 % naphthenic oil
- 50 - 65 % ester resin

Embodiment example 3:

[0037] As a commercially available hotmelt adhesive, the "Lunatack D 8370" product was used, which is available from H. B. Fuller GmbH. This is a hotmelt adhesive comprising about 35 % polyolefine, about 40 % hydrocarbon resin with a cyclopentadiene component, about 15 % polyisobutylene and about 10 % naphthenic oil.

Testing Procedure

[0038] The hotmelts according to embodiment examples 1 through 3 were placed in a customary processing machine provided with a slot nozzle such as Nordson EP 51. The slot nozzle was provided horizontally facing a roller over which a polypropylene nonwoven was led in an upward direction. The distance between the slot nozzle and the substrate was 2 mm, at a nozzle slot length of 70 mm. The web speed of the nonwoven was 25 m/min. At a system pressure of about 53 bar and a release temperature of the hotmelt of approximately 100°C, the hotmelt was coated onto the substrate, where it formed a closed barrier layer. Immediately thereafter, the thus coated substrate was adhered to a customary

absorptive body (tissue). In each case, a reliable adhesive bond between substrate and tissue was provided, and in each case, the hotmelt barrier layer formed between the tissue and the substrate was found to be completely liquid-impermeable. Processing was without any problems. The coating weight was an average of 21 g/m². At corresponding fine adjustment of release temperature of hotmelt, system pressure, distance between slot nozzle and substrate, machine speed etc., it was systematically possible to form water-tight closed barrier layers at area weights of less than 20 g/m² on this substrate.

Examples 4 - 16:

- [0039] Table 1 depicts rheological data on Examples 4 through 16. Column 2 of Table 1 depicts the reference temperature for the rheological parameters as well as the coating application temperature for each sample. Table 2 depicts the chemical description of Examples 4 through 9 as well as the coating parameters for those examples in which a continuous coating resulted. A consistent continuous coating was not able to be produced with Samples 4 through 9 at the temperature indicated in column 2. The applicants surmise that the inability to produce a continuous coating is due to the complex viscosity being greater than about 1,000 poise at about 1 rad/sec. By comparing Examples 5 with 14 and 4 with 10, the complex viscosity at 1 rad/sec can be forced into the rheological window by increasing the temperature. By comparing Example 7 with 16, the applicants have demonstrated the relatively narrow rheological window of Lunatack® D-3964. At 90°C D-3964 exhibits too high of a complex viscosity at 1 rad/sec. At 110°C, D-3964 exhibits too low of a complex viscosity at 1 rad/sec., causing the material to soak into the substrate. The applicants surmise a temperature exists between 90°C and 110°C wherein D-3964 would produce a continuous coating. However, a thermoplastic composition exhibiting such a narrow rheological window would have little chance of commercial success.
- [0040] Example 14 exhibits the utility of blending a thermoplastic composition that does not meet the rheological window with another material such that the resulting composition is useful for producing a continuous coating. In this particular example, since D-3964 exhibits too low of a complex viscosity at 1 rad/sec, it is blended with a material to raise the complex viscosity at 1 rad/sec such that the blend exhibits the preferable rheological properties. Alternatively, examples exhibiting too high of a complex viscosity at 1 rad/sec, such as Examples 4 through 9 can be blended with compatible materials to lower the complex viscosity such that the blended material may be coated at the preferable application temperature of less than 125°C.
- [0041] Examples 4 through 16 were tested in a similar manner as Examples 1 to 3. The application conditions and rheological data of the adhesive compositions are depicted in Table 1. A system pressure ranging from about 40 to about 65 bar was obtained during coating of Examples 10 through 16.
- [0042] The rheological data was generated from a dynamic mechanical spectrometer such as a Rheometric Scientific RDS 7700 (10,000 g/cm transducer, 10 g/cm - < 10,000 g/cm torque). A master curve of G' (shear storage modulus), G'' (shear loss modulus) and complex viscosity as a function of frequency was obtained through time temperature superposition. During testing the sample was loaded at the upper test temperature between 50 mm diameter parallel plate discs with a 1 to 2 mm gap. After allowing the sample temperature to stabilize for at least about 10 minutes, a frequency sweep was performed from about 0.1 to about 100 radians per second. Upon the completion of the frequency sweep, the sample temperature was lowered to the next temperature and the procedure repeated. The strain amplitude was adjusted to improve the resolution and ranged from about 20 % to about 40 %. After the frequency sweep was completed at the final, lowest temperature, time-temperature superposition was used to overlay the data into a single master curve at the application temperature. If the actual coating temperature was not one of the actual temperatures tested, the Williams, Landel, Ferry (WLF) (Ferry, J. D. Viscoelastic Properties of Polymers, 3rd Ed., Wiley: NY, 1980) equation was used to obtain the master curve.

Table 1

Example	Temp. (°C)	Complex Viscosity 1 rad/sec (poise)	Complex Viscosity 10^3 rad/sec (poise)	G' 1 rad/sec (dynes/cm ²)	Crossover Frequency (rad/sec)	Tan delta @ 1 rad/sec	Slope = Visc @ 1/1000 rad/sec	Continuous Coating Formed Yes / no
4	125	15000	100	10000	1	1	150	no
5	90	10000	300	3000	300	3	33	no
6	120	4500	1500	300	1000	30	4.5	no
7	90	3000	100	400	50	7	30	not tested
8	110	2000	500	700	10000	3	4	no
9	140	1000	500	50	> 1000	70	2	no
10	160	200	200	5	> 1000	4	1.25	yes
11	125	800	100	5000	20	1	8	yes
12	125	800	100	100	1000	10	8	yes
13	125	300	50	200	1	1	6	not tested
14	110	300	50	20	7000	20	6	yes
15	128	100	80	10	1000	10	1.25	yes
16	110	100	3.5	8	100	25	28	no

Table 2

Example	Tradename(s)	Chemical Description	Coating Weight (GSM)	Speed M/MIN	Permeability cm ³ of H ₂ O pressure
4	347-BD-19 (H. B. Fuller)	atactic polyolefin hotmelt adhesive (HMA)			
5	D-3964 + 10 % Vestoplast® 750	SEBS block copolymer / hydrocarbon resin / naphthenic oil HMA + atactic polyolefin			
6	Eastman AQ® 1350	water dispersible copolyester (WO 95/18191)			
7	D-3964	SEBS block copolymer / hydrocarbon resin / naphthenic oil HMA			
8	NP-2085 (HBF)	urethane			
9	Eastman AQ® 1350	See Example 9			
10	Eastman AQ® 1350	See Example 9			
11	Vestoplast® 703 (Huls)	atactic polyolefin	22	30	-
12	347-BD-33 (HBF)	atactic polyolefin HMA	10	30	100
13	Vestoplast® 703 + 10 % Parafint H4	atactic polyolefin + Fischer Tropsch wax			
14	D-3964 + 10 % Vestoplast® 750	SEBS block copolymer / hydrocarbon resin / naphthenic oil HMA + atactic polyolefin	9 - 11	34	50
15	D-8370	atactic polyolefin HMA	12	30	46
16	D-3964	See Example 10	8	30	-
17	Vestoplast® 750 + 10 & wax	See Example 13	15 - 16	30	-

Claims

1. A method of coating a thermoplastic composition onto a substrate, said method comprising the steps of:
 - 5 a) making a thermoplastic composition flowable;
 - b) advancing a substrate along a path;
 - c) dispensing a continuous film of said thermoplastic composition from a coating device at a coating temperature wherein the complex viscosity of the thermoplastic composition is less than about 500 poise at about 1000 radians/second and ranges from about 100 poise to about 1000 poise at about 1 radian/second;
 - 10 d) suspending said film between said coating device and said substrate;
 - e) contacting said film with said advancing substrate.
2. A method of coating a hot-melt adhesive composition onto a substrate, said method comprising the steps of:
 - 15 a) making a hot-melt adhesive flowable;
 - b) advancing a substrate along a path;
 - c) dispensing a continuous film of said hot-melt adhesive composition from a coating device;
 - d) suspending said film between said coating device and said substrate;
 - 20 e) contacting said film with said advancing substrate.
3. The method according to claim 1 or 2, wherein said substrate is selected from the group consisting of woven-, non-woven textile material, heat sensitive materials and plastic materials.
4. The method according to any of claims 1 to 3, characterized in that said coating device is disposed at a distance from said substrate preferably of at least about 0.5 mm, and more preferably not more than about 20 mm and wherein the coating device is preferably a slot nozzle.
5. The method according to any one of claims 1 to 4, characterized in that the coating device is provided in a part of the path of movement of the substrate wherein said path of movement is directed substantially vertically.
6. The method according to any one of claims 1 to 5, characterized in that the thermoplastic composition or the hot-melt adhesive composition is coated onto the substrate such that the coating weight is not more than about 30 g/m², preferably not more than about 20 g/m² and especially preferred about 10 g/m² or less.
7. The method according to any one of claims 1 to 6, characterized in that the thermoplastic composition or the hot-melt adhesive composition is released from the coating device at a temperature of less than about 125°C, preferably less than about 110°C.
8. The method according to any one of claims 1 to 7, characterized in that the complex viscosity of the thermoplastic composition or the hot-melt adhesive composition is less than about 500 poise at about 1,000 radians/sec at the coating temperature.
9. The method according to any one of claims 1 to 8, characterized in that the complex viscosity of the thermoplastic composition or the hot-melt adhesive composition ranges from about 100 to about 1,000 poise at about 1 radian/sec at the coating temperature.
10. The method according to any one of claims 1 to 9, wherein the hot-melt adhesive is released from the coating device at a temperature less than about 160°C.
11. A method for producing a moisture-absorbing hygienic article comprising at least one structural element of absorbent material, at least one moisture-impermeable, in case water vapor-permeable inner barrier layer substantially covering the absorbent element and at least one outer layer of textile material which is bonded to the barrier layer on one face, characterized in that for forming the inner barrier layer, a thermoplastic composition or hot-melt adhesive composition is coated according to any one of claims 1 to 10 as a continuous closed film from a coating device onto the textile material of the outer layer without the coating device contacting the substrate.
12. The method according to claim 11, characterized in that the thermoplastic composition, preferably formed by a hot-melt adhesive film, is coated onto the substrate with an area weight not exceeding 30 g/m², preferably not exceed-

ing 20 g/m² and especially preferred less than 10 g/m².

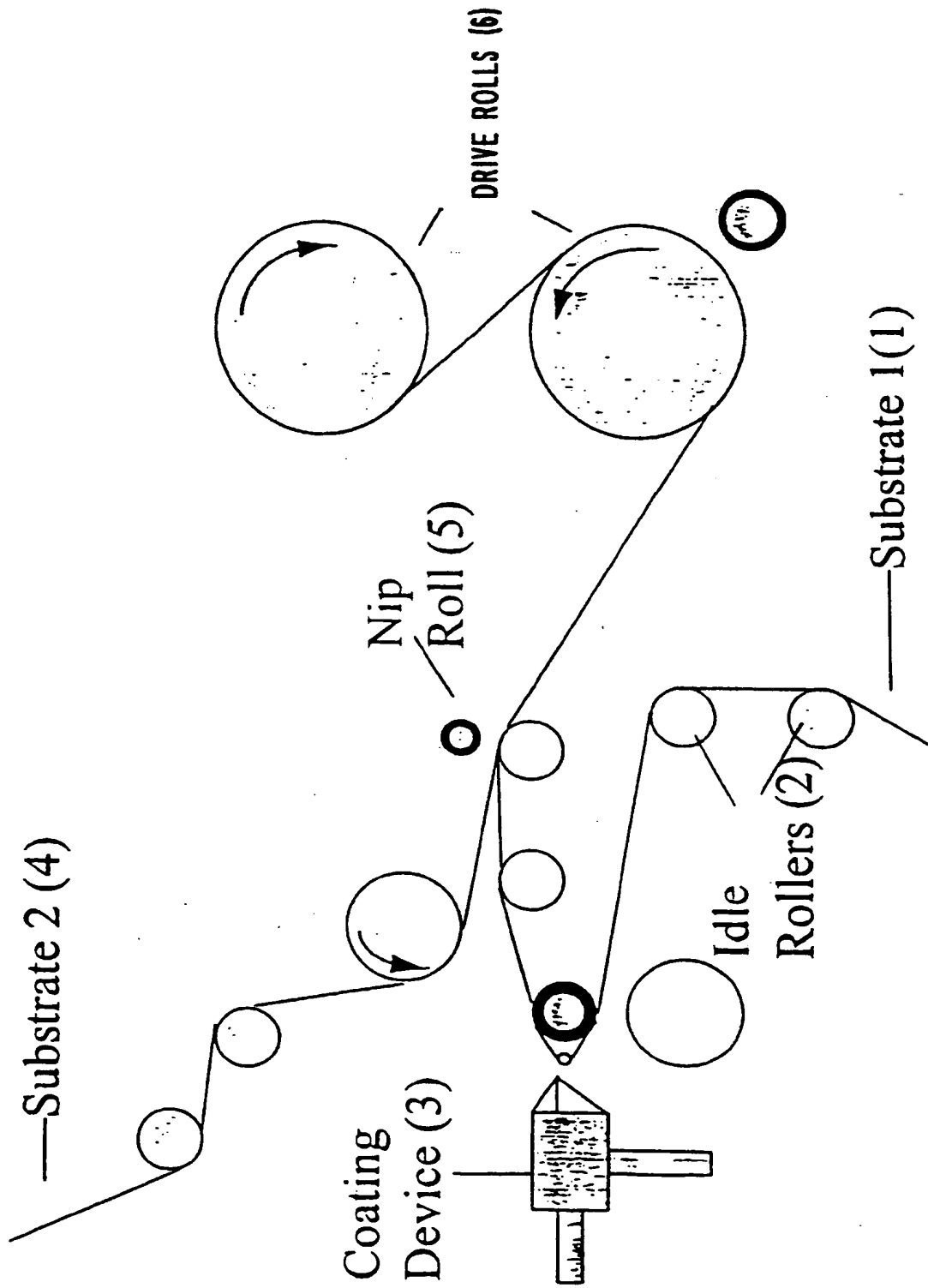
5 13. The method according to claim 11 or 12, characterized in that the thermoplastic composition forming the barrier layer is coated onto the textile material and said material is thereafter combined with the material forming the absorbent element so that the hot-melt is only adhered at the surfaces of the textile material and the absorbent element and thus bonds the textile material and the element to each other.

10 14. The method according to claim 13, characterized in that the textile material and the absorbent element are combined and bonded "inline" immediately after the coating of the hot-melt.

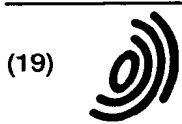
15 15. A method of coating, wherein a thermoplastic composition or a hot-melt adhesive composition which has been thermally made flowable, is coated from a coating device onto a substrate, characterized in that said composition is released from said coating device at a temperature of less than 125°C, preferably less than 110°C as a continuous coating without contact between said coating device and said substrate, and is subsequently disposed upon the surface of said substrate.

20 16. A disposable hygienic article, comprising at least one first layer, which is a body fluid permeable substrate, and at least one second layer which is a body fluid impermeable barrier layer formed by the method of any one of claims 11 through 15.

FIGURE 1



THIS PAGE BLANK (USPTO)



Europäisches Patentamt
European Patent Office
Office européen des brevets



(11) EP 0 947 185 A3

(12) EUROPEAN PATENT APPLICATION

(88) Date of publication A3:
12.01.2000 Bulletin 2000/02

(51) Int. Cl.⁷: A61F 13/15, A61F 13/00

(43) Date of publication A2:
06.10.1999 Bulletin 1999/40

(21) Application number: 99114110.2

(22) Date of filing: 30.01.1996

(84) Designated Contracting States:
CH DE ES FR GB IT LI NL

(30) Priority: 23.02.1995 WO PCT/EP95/00665

(62) Document number(s) of the earlier application(s) in
accordance with Art. 76 EPC:
98114701.0 / 0 901 781
96903949.4 / 0 814 736

(71) Applicant:
H.B. Fuller Licensing & Financing, Inc.
St. Paul, Minnesota 55110-5132 (US)

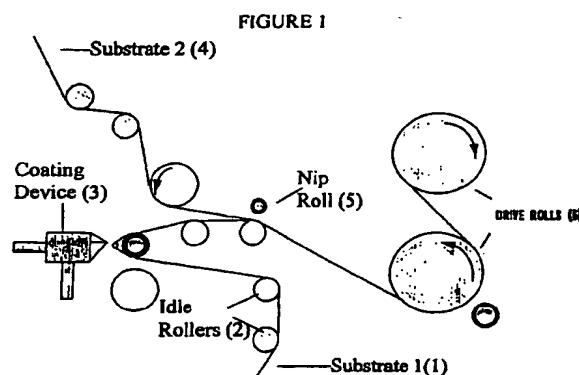
(72) Inventors:
• Werenicz, Harald
21391 Reppenstedt (DE)
• Wittkopf, Thomas
21360 Vögelzen (DE)

• Voss, Gerhard
21335 Lüneburg (DE)
• Remmers, Peter
21039 Hamburg (DE)
• Katsaros, Mark G.
Doloth, GA 30097 (US)
• Polance, Robert Gordon
Lino Lakes, MN 55014 (US)
• Kroll, Mark S.
Arden Hills, MN 55112 (US)

(74) Representative:
Maiwald, Walter, Dr. Dipl.-Chem. et al
Maiwald GmbH,
Elisenhof,
Elisenstrasse 3
80335 München (DE)

(54) Method for producing a continuous thermoplastic coating and articles constructed therefrom

(57) This invention relates to a non-contact coating method for producing a continuous coating and articles constructed therefrom. This invention further relates to a method for producing a textile material with a moisture-impermeable barrier layer and to a method for producing a moisture-absorbing article of hygiene which has such a barrier layer. This invention particularly relates to a textile material and hygienic disposable articles comprising a body fluid impermeable barrier layer produced from said coating method. Preferably, the thermoplastic composition used in the method for producing the barrier layer exhibits certain rheological characteristics.





European Patent
Office

EUROPEAN SEARCH REPORT

Application Number
EP 99 11 4110

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.6)
A	EP 0 295 694 A (TOPPAN PRINTING CO LTD) 21 December 1988 (1988-12-21) * abstract; claims; figure 1 *	1-16	A61F13/15 A61F13/00
A	EP 0 189 911 A (KIMBERLY CLARK CO) 6 August 1986 (1986-08-06)		
D,A	US 4 692 161 A (DECOWSKI JR STANLEY J ET AL) 8 September 1987 (1987-09-08)		
D,A	EP 0 187 728 A (KIMBERLY CLARK CO) 16 July 1986 (1986-07-16)		
D,A	US 4 627 847 A (DECOWSKI JR STANLEY J ET AL) 9 December 1986 (1986-12-09)		
			TECHNICAL FIELDS SEARCHED (Int.Cl.6)
			A61F
The present search report has been drawn up for all claims			
Place of search THE HAGUE		Date of completion of the search 19 November 1999	Examiner Soederberg, J
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document			

EPO FORM 1503 03 82 (P04C01)

ANNEX TO THE EUROPEAN SEARCH REPORT ON EUROPEAN PATENT APPLICATION NO.

EP 99 11 4110

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report. The members are as contained in the European Patent Office EDP file on
The European Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

19-11-1999

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
EP 0295694 A	21-12-1988	JP 1071740 A	16-03-1989
		KR 9602725 B	26-02-1996
		US 4857393 A	15-08-1989
EP 0189911 A	06-08-1986	US 4610745 A	09-09-1986
		AU 5279986 A	07-08-1986
		BR 8600402 A	14-10-1986
		ES 551484 A	01-02-1987
		GB 2170431 A	06-08-1986
		JP 61228077 A	11-10-1986
		US 4846827 A	11-07-1989
US 4692161 A	08-09-1987	US 4627847 A	09-12-1986
		AU 565866 B	01-10-1987
		CA 1291325 A	29-10-1991
		DE 3688651 A	05-08-1993
		DE 3688651 T	14-10-1993
		EP 0196654 A	08-10-1986
		EP 0400694 A	05-12-1990
		JP 1863247 C	08-08-1994
		JP 5060944 B	03-09-1993
		JP 61232846 A	17-10-1986
		MX 167148 B	08-03-1993
		US 4718898 A	12-01-1988
EP 0187728 A	16-07-1986	US 4641381 A	10-02-1987
		US 4610681 A	09-09-1986
		US 4646362 A	03-03-1987
		AT 46809 T	15-10-1989
		AU 579696 B	08-12-1988
		AU 5186986 A	17-07-1986
		BR 8600096 A	23-09-1986
		CA 1276051 A	13-11-1990
		GB 2170394 A, B	06-08-1986
		JP 61207605 A	16-09-1986
		PH 23935 A	23-01-1990
		SG 92491 G	13-12-1987
		CA 1276052 A	13-11-1990
US 4627847 A	09-12-1986	AU 565866 B	01-10-1987
		CA 1291325 A	29-10-1991
		DE 3688651 A	05-08-1993
		DE 3688651 T	14-10-1993
		EP 0196654 A	08-10-1986
		EP 0400694 A	05-12-1990
		JP 1863247 C	08-08-1994

EPO FORM P0459

For more details about this annex : see Official Journal of the European Patent Office, No. 12/82

EP 99 11 4110

19-11-1999

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 4627847 A		JP 5060944 B	03-09-1993
		JP 61232846 A	17-10-1986
		MX 167148 B	08-03-1993
		US 4718898 A	12-01-1988
		US 4692161 A	08-09-1987

For more details about this annex : see Official Journal of the European Patent Office, No. 12/82